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ABSTRACT

Universities across the nation have established criteria in the selection of students for admission. This correlational study was conducted to determine predictors of academic performance and retention of freshmen in a college of agriculture. Freshmen enrolled in a college-wide learning and development course in the fall of 1997 (n=245) and 1998 (n=195) at the University of Missouri participated. The following admission criteria were investigated as possible predictors of academic performance and retention: ACT examination, high school core grade point average (GPA), and high school class rank. In addition, students' preferred learning styles were investigated as a possible predictor of academic performance and retention. Regression analysis was utilized to account for the variance in students' cumulative GPA at the completion of the freshman academic year. Step-wise discriminant analysis was performed to build a predictive model that could determine whether a linear combination of learning style, ACT score, high school class rank, and high school core GPA could be used to predict student enrollment status for the fall semester of the sophomore year. Learners preferring a field-independent learning style exhibited a tendency for greater academic performance than did their field-dependent peers in the first year of college. The best predictor of academic performance during the first year of college for 1997 freshman was a combination of their high school core GPA and ACT score. However, high school core GPA alone was the best predictor of college academic performance for freshman who began their college career in 1998. Furthermore, learning style was not a predictor of students' academic performance during their first year of enrollment in a college of agriculture. Only the traditional university admission variable of high school core GPA was successful in predicting students' first year cumulative GPA. In the current study, the traditional criteria used for college admission was found to have limited value in predicting agriculture students' retention. The study raises questions regarding the effectiveness of current college admission variables as predictors of agriculture students' academic performance and retention. (Contains 24 references.) (Author/MM)

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Predicting College Agriculture Students' Academic Performance And Retention: A Trend Study

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Abstract

Universities across the nation have established criteria in the selection of students for admission. This correlational study was conducted to determine predictors of academic performance and retention of freshmen in a college of agriculture. Freshmen enrolled in a college-wide learning and development course in the Fall of 1997 (n = 245) and 1998 (n = 195) at the University of Missouri participated. The following admission criteria were investigated as possible predictors of academic performance and retention: ACT examination, high school core grade point average (GPA), and high school class rank. In addition, students' preferred learning styles were investigated as a possible predictor of academic performance and retention. Regression analysis was utilized to account for the variance in students' cumulative GPA at the completion of the freshmen academic year. Step-wise discriminant analysis was performed to build a predictive model that could determine whether a linear combination of learning style, ACT score, high school class rank, and high school core GPA could be used to predict student enrollment status for the fall semester of the sophomore year.

Learners preferring a field-independent learning style exhibited a tendency for greater academic performance than did their field-dependent peers in the first year of college. The best predictor of academic performance during the first year of college for 1997 freshmen was a combination of their high school core GPA and ACT score. However, high school core GPA alone was the best predictor of college academic performance for freshmen who began their college career in 1998. Furthermore, learning style was not a predictor of students' academic performance during their first year of enrollment in a college of agriculture. Only the traditional university admission variable of high school core GPA was successful in predicting students' first year cumulative GPA. In the current study, the traditional criteria used for college admission was found to have limited value in predicting agriculture students' retention. The study raises questions regarding the effectiveness of current college admission variables as predictors of agriculture students' academic performance and retention.

Introduction/Theoretical Framework

Universities across the nation have established criteria in the selection of students for admission. While the selection criteria vary among universities, most universities use some combination of high school grade point average, high school class rank, and ACT examination.

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However, are these admission criteria valid in predicting academic performance and retention of agriculture students? Can certain variables be added or excluded from such admission equations to provide more accurate and efficient selection criteria for college of agriculture students?

Students' academic performance and their continued enrollment are a concern for universities and their respective colleges. Several studies have placed high monetary values on student retention (Dyer, Lacey, & Osborne, 1996; Glennen, Farren, & Vowell, 1996). Vernon (1996) noted that factors other than academic performance influence student retention. Dyer and Breja (1999) reported that retention could be predicted by examining the criteria by which students were admitted. They further indicated that traditional admission criteria were not the best predictors of academic performance and retention of agriculture students. Enrollment in secondary agriculture classes and agricultural experience were two factors that appeared to have a more accurate prediction value of student retention.

In addition to research concerning admission variables, research has been conducted regarding the relationship between students' learning styles and academic performance (Witkin, 1973; Gregorc, 1979; Garger & Guild, 1984; Claxton & Murrell, 1987; Schroeder, 1993). These studies concluded that when learning styles were considered in the teaching-learning process, student achievement was enhanced. Regarding the relationship between learning styles and retention, Matthews (1996) concluded that the interaction of learning style, race, and gender could be utilized to predict students' retention in postsecondary institutions. Schroeder (1993) acknowledged that being cognizant of and accommodating variations in learning styles could improve curricula, the teaching-learning process, and ultimately the retention of students in higher education.

Gregorc (1979) described a person's learning style as consisting of distinct behaviors which serve as indicators of how a person learns and adapts to his/her learning environment. The most extensively researched and applied learning style construct has been the field-dependence/independence dimension (Guild & Garger, 1985). Chickering (1976) noted that the field-dependence/independence dimension had major implications for college admissions and for faculty who make decisions about learning environments and practices.

Individuals who prefer a field-dependent learning style tend to have a global perception, have a more difficult time solving problems, are more attuned to their social environment, learn better when concepts are humanized, and tend to favor a spectator approach to learning. Additionally, individuals preferring a field-dependent learning style have been found to be more extrinsically motivated when organization and structure is provided by the teacher (Witkin et al., 1977).

Conversely, individuals who prefer a field-independent learning style tend to view concepts more analytically, therefore finding it easier to solve problems. Individuals preferring a field-independent learning style are more likely to favor learning activities that require individual effort and study. In addition, they prefer to develop their own structure and organization for

learning, are intrinsically motivated, and are less receptive to social reinforcement. (Witkin et al., 1977).

Recent studies have focused on assessing the learning styles of students in colleges of agriculture. Learning styles have been found to have a positive relationship with academic performance, as measured by grade point average (Torres, 1993; Torres & Cano, 1994), performance in agriculture courses (Garton, Dauve, & Thompson, 1999), and overall success in higher education (Cano & Porter, 1997; Cano, 1999).

Previous research has identified students' learning styles and reported associations between learning style and academic performance and retention. However, data is lacking that describes the relationship between university admission criteria and learning styles to students' academic performance and retention in colleges of agriculture. Universities use selected criteria to determine if students are likely to be successful in their academic endeavors. By analyzing the admission criteria of groups of students who have been successful against groups who have not, the possibility exists to classify subsequent applicants for retention purposes based upon an analysis of admission criteria. Consequently, what are the best predictors of students' academic performance and retention; and further, are there emerging trends or patterns within such predictor variables? Possessing this knowledge could provide faculty and academic advisors with the necessary information to assist at-risk students.

Purpose/Objectives

The purpose of this study was to determine predictors of academic performance and retention of freshmen in the College of Agriculture, Food and Natural Resources at the University of Missouri. The specific objectives of the study were to:

1. Describe the relationship between students' learning styles and academic performance as measured by cumulative grade point average at the completion of the freshmen academic year.
2. Determine the best predictors of academic performance as measured by cumulative grade point average at the conclusion of the freshmen academic year.
3. Determine whether a linear combination of university admission variables and/or learning style could predict the retention of students for enrollment in the sophomore year.

Methods/Procedures

Population and Sample

The target population for this correlational trend study was freshmen entering the College of Agriculture, Food and Natural Resources at the University of Missouri in the Fall of 1997 (N = 326) and 1998 (N = 338). The accessible sample consisted of intact groups of freshmen enrolled in a college learning and development course in the Fall of 1997 (n = 245) and 1998 (n =

195). Krathwol (1998) described a trend study as one that follows the changes in a particular population where the sample as well as the population itself changes over time.

Instrumentation

The Group Embedded Figures Test (GEFT) (Witkin, Oltman, Raskin, & Karp, 1971) was administered to assess the preferred learning style of students as field-dependent or field-independent. The possible range of scores on the GEFT is zero to 18. Individuals scoring 11 or less were considered to prefer a field-dependent learning style, while individuals scoring 12 or greater were considered to prefer a field-independent learning style.

The GEFT is a standardized instrument that has been used in educational research for more than 25 years (Guild & Garger, 1985). The validity and reliability of the GEFT was established by the developers of the instrument. The GEFT is a timed test, therefore internal consistency was measured by treating each section as split halves (r = .82) (Witkin et al., 1971).

Data Collection and Analysis

The GEFT was administered to Fall 1997 and 1998 freshmen enrolled in a college learning and development course during the second week of the semester. Academic performance was measured by cumulative grade point average at the completion of the freshmen academic year. University admission variables included ACT score, high school class rank, and high school core grade point average. High school core grade point average was calculated based on courses required by the university for admission, and was determined from university admission data. Retention was determined based on enrollment status at the beginning of the first semester of the sophomore year.

Descriptive statistics were generated on GEFT scores and academic admission variables (ACT, high school core GPA, and high school rank). Pearson product-moment correlation coefficients were calculated between GEFT scores and academic admission variables and were interpreted using Davis=s (1971) descriptors. Regression analysis was used to explain variance in students= cumulative GPA at the completion of the freshmen academic year. Step-wise discriminant analysis was performed to build a predictive model of independent variables that could determine whether a linear combination of GEFT score, ACT score, high school class rank, and high school core GPA could be used to predict student enrollment status for the fall semester of the sophomore year. An alpha level of .05 was established a priori.

Results/Findings

The first objective sought to describe the relationship between students' learning styles and academic performance at the completion of the freshmen academic year. In 1997, a majority (73%) of the students possessed a preference for a field-independent learning style (Table 1). The remaining students (27%) preferred a field-dependent learning style. Similar results were found in 1998 where a majority (62.5%) of the students possessed a field-independent learning style with the remaining students (37.5%) preferring a field-dependent learning style. Students

were grouped according to cumulative grade point average at the completion of the freshmen academic year and categorized by their learning style preference.

Table 1
Relationship Between Learning Style and Academic Performance at the Completion of the Freshmen Academic Year

Cumulative GPA	1997 (n = 245)				1998 (n = 195)			
	Field-Dependent		Field-Independent		Field-Dependent		Field-Independent	
	n	%	n	%	n	%	n	%
3.50 - 4.00	7	2.9	41	16.7	6	3.1	17	8.7
3.00 - 3.49	15	6.1	50	20.4	10	5.1	29	14.9
2.50 - 2.99	22	9.0	45	18.4	22	11.3	36	18.5
Total (_2.50)	44	(66.6)	136	(76.0)	38	(52.0)	82	(67.0)
2.00 - 2.49	14	5.7	27	11.0	20	10.3	17	8.6
1.50 - 1.99	5	2.0	7	2.9	11	5.6	15	7.7
below 1.49	3	1.2	9	3.7	4	2.1	8	4.1
Total (<2.50)	22	(33.3)	43	(24.0)	35	(48.0)	40	(33.0)
Grand Total	66	26.9	179	73.1	73	37.5	122	62.5

Note. 1997: r = .21; Cumulative GPA M = 2.88, SD = .70; GEFT M = 13.3, SD = 3.88
1998: r = .15; Cumulative GPA M = 2.62, SD = .74; GEFT M = 12.5, SD = 4.69

An analysis revealed that 67% of the 1997 freshmen possessing a field-dependent learning style achieved a cumulative GPA of 2.5 or greater for their freshmen academic year, while 33% earned less than a 2.5 cumulative GPA. Conversely, 76% of the students possessing a preference for a field-independent learning style achieved a GPA of 2.5 or greater at the culmination of the freshmen academic year, while the remaining 24% earned less than a 2.5 cumulative GPA. A low positive relationship (r = .21) existed between students' GEFT scores and their cumulative freshmen year GPA.

Similar results were found when analyzing the 1998 data. Fifty two percent of the 1998 freshmen possessing a field-dependent learning style achieved a cumulative GPA of 2.5 or greater for their freshmen academic year, while 48% earned less than a 2.5 cumulative GPA. Further analysis revealed that 67% of the students preferring a field-independent learning style achieved a GPA of 2.5 or greater at the culmination of the freshmen academic year, while the remaining 33% earned less than a 2.5 cumulative GPA. A low positive relationship (r = .15) existed between students' GEFT scores and their cumulative freshmen year GPA.

The second research objective sought to determine the best predictors of students' academic performance at the completion of the freshmen academic year. Substantial positive intercorrelations were found between the predictor variables of ACT and high school core GPA (r = .56 in 1997 and r = .55 in 1998) and high school class rank (r = .54 in 1997 and r =. 50 in 1998) (Table 2). In addition, a very strong positive association was found between high school core GPA and high school class rank (r = .86 in 1997 and r = .88 in 1998). Meanwhile, low positive associations were identified between GEFT scores and the predictor variables of high school core GPA (r = .22 in 1997 and r = .25 in 1998) and high school class rank (r = .24 in 1997 and r = .23 in 1998). A moderate positive association was found between GEFT and ACT scores (r = .36 in 1997 and r = .44 in 1998). Substantial positive correlations were identified between the criterion variable (cumulative GPA) and high school core GPA (r = .61 in 1997 and r = .57 in 1998) and high school class rank (r = .52 in 1997 and r = .49 in 1998).

Table 2
Intercorrelations of Variables Regressed on Cumulative Grade Point Average at the Conclusion of the Freshmen Academic Year

Variable	1	2	3	4	5
			1997 (n = 245)		
1. GEFT	--	.36	.22	.24	.21
2. ACT		--	.56	.54	.47
3. High school core GPA			--	.86	.61
4. High school class rank				--	.52
5. Cumulative GPA					--
			1998 (n = 192)		
1. GEFT	--	.44	.25	.23	.15
2. ACT		--	.55	.50	.38
3. High school core GPA			--	.88	.57
4. High school class rank				--	.49
5. Cumulative GPA					--

Note. 1997: ACT M = 24.8, SD = 4.0; High school core GPA M = 3.38, SD = .52; High school class rank (percentile) M = 77.6, SD = 18.4
1998: ACT M = 23.8, SD = 3.9; High school core GPA M = 3.27, SD = .54; High school class rank (percentile) M = 73.7, SD = 19.7

The intercorrelation matrix of predictor variables revealed the presence of multicollinearity, a potential violation of the assumptions in using multiple linear regression. Using guidelines offered by Lewis-Beck (1980), each independent variable was regressed on the remaining independent variables. Regressing the independent variables on high school core GPA

resulted in R^2 values of .75 and .79, respectively for 1997 and 1998, indicating a high degree of multicollinearity. Furthermore, R^2 values of .74 (1997) and .77 (1998) were found when the independent variables were regressed on high school class rank, again indicating a high degree of multicollinearity. Due to a lower correlation coefficient with the criterion variable, high school class rank was excluded from consideration in the regression equation.

Step-wise multiple regression was used to explain the variance in student cumulative GPA at the completion of the freshmen academic year. An analysis of the 1997 freshmen indicated that 39% of the variance in their first year cumulative GPA could be explained by a linear combination of high school core GPA and ACT score (Table 3). Students' GEFT scores did not enter the regression equation. By comparison, only 31% of the variance in the first year cumulative GPA of the 1998 freshmen could be explained and was accounted for by one variable, high school core GPA. Students' GEFT scores and ACT scores were excluded from the regression equation.

Table 3
Step-wise Regression of High School Core GPA and GEFT Score on Cumulative GPA at the Conclusion of the Freshmen Academic Year

	1997 (n = 245)			1998 (n = 192)		
Variable	R^2	b	t	R^2	b	t
High school core GPA	.37	.69	8.11*	.31	.55	8.96*
ACT	.39	.03	3.12*	--	--	--
(Constant)		- .24			- .29	

*p < .05

The third objective sought to determine the best predictors of retention as evidenced by students' continuing enrollment at the beginning of the sophomore year. To accomplish this purpose, a discriminant analysis procedure was used to generate a predictive model of linear relationships between learning style (GEFT score) and admission criteria (ACT score, high school core GPA) and continued enrollment. Descriptive data for the discriminating variables used for the model are presented in Table 4. Again, due to the presence of multicollinearity between the variables high school core GPA and high school class rank, the latter variable was omitted from consideration. In addition, due to missing data on discriminating variables, the step-wise discriminant analysis procedure used mean scores for eight cases in 1997 and six in 1998.

Table 4
Means and Standard Deviations of Discriminating Variables

1997 (n = 245)	1998 (n = 192)

Discriminating Variables	Not-continuing (n = 24)		Continuing (n = 221)		Not-continuing (n = 29)		Continuing (n = 163)	
	M	SD	M	SD	M	SD	M	SD
GEFT	14.3	3.5	13.1	3.8	13.2	4.6	12.4	4.8
ACT	23.9	2.8	24.8	4.1	23.3	3.6	23.9	3.9
H.S. Core GPA	3.14	.38	3.41	.50	2.95	.47	3.35	.52

An analysis of the 1997 freshmen produced a model with two discriminating variables, GEFT score and high school core GPA (Table 5). ACT score was eliminated as a discriminating variable. The centroid for students continuing their enrollment was significantly different from those students who did not return for their sophomore year (Wilks' Lambda = .95, $p < .002$). The discriminating power of the discriminant function, expressed as an eigenvalue, was .26. The degree of association between the groups and the discriminant scores was expressed as a canonical correlation of .45. The discriminant analysis model successfully predicted group membership in 67% of the cases for non-continuing students and 67% of the cases for continuing students (Table 6). Overall the discriminant function was accurate in predicted 67% of the cases.

Table 5
Summary Data for Discriminant Analysis for 1997 Freshmen (n = 245)

Discriminating Variable	b	s	Group	Centroids
GEFT	-.71	-.51	Not-continuing	-.73
H.S. Core GPA	.88	.72	Continuing	.07
Eigenvalue	R_c		Wilks' Lambda	$p < .002$
.26	.45		.95	

Table 6
Classification of Cases for 1997 Freshmen (n = 245)

		Predicted Group	
Group	No. of Cases	Not-continuing	Continuing
Not-continuing	24	16 (66.7%)	8 (33.3%)
Continuing	221	73 (33.0%)	148 (67.0%)
Percent of cases correctly classified: 66.9%			

An analysis of the 1998 freshmen was conducted to determine if trends or patterns were emerging in predicting retention of college agriculture students into the second year of college.

The analysis produced a model with one discriminating variable, high school core GPA (Table 7). ACT and GEFT score were eliminated as discriminating variables. The centroid for students continuing their enrollment was significantly different from those students who did not return for their sophomore year (Wilks' Lambda = .93, $p < .002$). The discriminant analysis model successfully predicted group membership in 59% of the cases for non-continuing students and 64% of the cases for continuing students (Table 8). In total, the discriminant function correctly predicted 63% of the cases.

Table 7

Summary Data for Discriminant Analysis for 1998 Freshmen (n = 192)

Discriminating Variable	b	s	Group	Centroids
H.S. Core GPA	.77	.55	Not-continuing	-.66
			Continuing	.12

Eigenvalue	R_c	Wilks' Lambda	$p < .002$
.08	.27	.93	

Table 8

Classification of Cases for 1998 Freshmen (n = 192)

		Predicted Group	
Group	No. of Cases	Not-continuing	Continuing
Not-continuing	29	17 (58.6%)	12 (41.4%)
Continuing	163	59 (36.2%)	104 (63.8%)

Percent of cases correctly classified: 63.0%

Conclusions/Implications/Recommendations

Learners preferring a field-independent learning style exhibited a tendency for greater academic performance than their field-dependent peers in the first year of college. A greater percentage of students with a field-independent learning style preference, attained a cumulative GPA of 2.5 or greater than students with a field-dependent learning style preference. Does this imply that students possessing a preference for a field-independent learning style were academically superior? Perhaps a more plausible conclusion would be that instructors' teaching styles, course assignments/projects, and course assessments were better suited to the strengths of field-independent learners. While students with the field-independent learning style preference exhibited higher grade point averages in general, learning style had no predictive value when other variables were considered in predicting academic performance in the first year of college.

The best predictor of academic performance during the first year of college for 1997 freshmen was a combination of their high school core grade point average and ACT score. However, high school core grade point average alone was the best predictor of college academic performance for freshmen who began their college career in 1998. Although Witkin, et. al. (1977) noted that field-independent learners tend to favor careers in areas such as agriculture, GEFT

score was not a predictor of students' academic performance during their first year of enrollment in a college of agriculture.

Only the traditional university admission variable of high school core GPA was successful in predicting students' first year cumulative GPA. High school core GPA accounting for approximately one-third of the variance in students' academic performance in the first year of college. Prior research also identified high school grade point average as a predictor of students' first year academic performance (Murtaugh, et. al., 1999; Wold &Worth, 1991). The findings of the current study and those of prior research should raise concern with the use of university wide admission criteria as adequate predictors for the success of students enrolled in colleges of agriculture. What additional variables account for the remaining variance in the academic performance of first year students? Additional research is needed to establish valid and reliable predictors of student success in colleges of agriculture.

In the current study the criteria used for college admission was found to have limited value in predicting agriculture student retention. While high school core GPA and GEFT score appeared to influence a student's choice to continue his/her education in 1997, this pattern was not repeated in the subsequent year. For 1998 freshmen, high school core GPA was the lone variable found to have predictive value for retaining agriculture students for the sophomore year. Should other variables be considered in admitting students to colleges of agriculture? Further quantitative and qualitative research is needed to identify if other variables exist that can predict whether students choose to continue or discontinue their education. Further research is needed to determine the strength of and establish trends between this as well as other variables regarding student performance and retention in colleges of agriculture.

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